F 3118 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Mechanical Engineering/Polymer Engineering/Automobile Engineering

STRENGTH OF MATERIALS AND STRUCTURAL ENGINEERING (M,P,U,)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Assume missing data if any suitably.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. How will you determine temperature stresses in a composite bar ?
2. Determine the expression for extension in a uniformly tapering circular bar, subjected to an axial force 'P'.
3. What are statically indeterminate beams ?
4. Briefly explain the warping of cross-section of a beam due to shear.
5. State Mohr's first theroem in area moment method.
6. Briefly discuss the concept of similarity between shear force of conjugate beam and slope of real beam.
7. Derive an expression for axial torque in an open-coiled helical spring.
8. Derive an expression for volumetric strain of thin cylindrical shell.
9. Define 'Radius of gyration and 'slenderness ratio'.
10. What are the different types of reinforcements ?

(10 × 4 = 40 marks)

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Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. (a) Derive an expression for temperature stresses in a composite bar. List all the necessary assumptions.

Or

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(b) A reinforced concrete column 500 mm diameter has four steel rods of 30 mm diameter embedded in it and carries a load of 680 kN. Find the stresses in steel and concrete. Take 'E' for steel = 2.04×10^5 N/mm^2 and 'E' for concrete = 0.136×10^5 N/mm^2. Find also the adhesive force between steel and concrete.

12 (a) A beam of span 'L', simply supported at the ends, is loaded with a triangular load with intensity zero at one end to 'w' per unit length at the other end. Plot the shear force and bending moment diagrams, indicating the principal values.

Or

(b) Show that for all values of 'D/d' of a hollow circular section of outer diameter 'D' and inner diameter 'd' the ratio of maximum to average stress intensities lies between 4/3 to 2.

13. (a) A beam of length 'L' hinged at the ends, carries a couple 'μ' at a distance 'a' from the left end. Find the slope at each end and the deflection at the point of application of the couple.

Or

(b) A beam, simply supported at ends A and B is loaded with two point loads of 30 kN each at a distance of 2m and 3m respectively from end A. Determine the position and magnitude of the maximum deflection. Take E = 2×10^5 N/mm^2 and I = 7200 cm^4.

14. (a) Calculate the angle of twist for a shaft having diameter of 60 mm at one end and 70 mm at the other end in a length of 2m. Also, find the percentage error committed in calculating θ, if it is calculated on the basis if an average diameter of 65 mm.

Or

(b) Describe the characteristics of semi-elliptic springs. Derive an expression for deflection of the spring.

15. (a) A mild steel column is of hollow circular section with 100 mm as external diameter and 80 mm as internal diameter. The column is 2.4 m long, hinged at both ends and has to carry a load of 60 kN at an eccentricity of 16 mm from the geometrical axis. Calculate the maximum and minimum intensities of stresses. Also calculate the maximum possible eccentricity so that no tension is induced anywhere in the section. Take E = 2×10^5 N/mm^2.

Or

(b) A hollow cast iron column with fixed ends supports an axial load of 800 kN. If the column is 3m long and has an external diameter of 200 mm, find the thickness of metal required. Use Rankine's formula, taking a constant of $\frac{1}{6400}$ and assume a working stress of 90 N/mm^2.

(5 × 12 = 60 marks)